DETAILED RESPONSE TO ACTION RESPONSE

Item 2

The cited patent application by Struhsaker [Pub. No. US 2002/0136170 A1] does not anticipate the invention because he uses TDMA (time division multiple access) for the transmission of data traffic. TDMA is a *deterministic centralized medium access method*. The invention employs *distributed asynchronous contention-based access* (DACA). While both methods use TDD, they are fundamentally two very different access methods. Struhsaker's method is centrally directed and requires synchronization, which makes it more costly and difficult to implement. My method is distributed and does not require synchronization, whence arises the simplicity of implementation.

More efficient channel utilization is another advantage of DACA. There is little time when the channel is sitting idle with DACA. According to Struhsaker's TDMA access method, the access point allocates in advance channel time for downlink and uplink transmissions on an individual station basis. If a station does not have as much traffic pending transmission as it has been allocated time to transmit, its allocated time will go unused. The access point cannot use the channel if no station is transmitting; it must wait until the next TDD frame to transmit [para. 128-134], letting the channel sit idle in the meanwhile. According to the invention, the access point will behave differently than in Struhsaker's method. If there is traffic pending transmission at the AP, the access point will seize the channel and transmit downlink as soon as the stations run out of traffic to send and cease transmitting. Hence, DACA results in a different time use of the channel, which is more efficient.

The invention employs an asynchronous contention-based medium access protocol, as stated in claims 21, 31, and 36. Regarding these claims, the action report cites the term "distributed", used by Struhsaker when describing "a highly accurate *distributed timing architecture* to align the start points of the downlink transmissions" [para. 140 and 141] among different sectors of a cell and different cell sites. In para. 158, he states: "Timing is distributed across a redundant set of clock and framing signals." Clearly the use of the term "distributed" by Struhsaker refers to clock synchronization, not to the medium access method. It is important to note that the need for synchronization, a requirement for any TDMA system, is one of the ways our two access methods differ. Clock synchronization, while it can be employed in selected embodiments of the invention, is not a requirement.

Struhsaker uses neither a *distributed* nor a *contention-based* medium access method, as suggested in the action report. Neither the base station (equivalent to my access point) nor the subscriber access devices (equivalent to my stations), access the channel by contention to transmit their data traffic in Struhsaker's method. Data traffic is transmitted through the use of *TDMA*, [para. 125-137]. TDMA is a centralized and deterministic medium access mechanism, not distributed.

Para. 191-194 make clear that the medium access method employed in Struhsaker's method is not *distributed* or *contention-based*. Specifically, para. 192 states: "the access processor for the RF modem shelf ... determines the appropriate allocation of downlink and uplink portions of TDD frames for a single cell site". The base station in Struhsaker's method notifies the subscriber access devices of when and how all transmission will occur by sending the frame header, which is "a broadcast message that synchronizes the start of frame and contains access control information on how the remainder of TDD frame 321 is configured" [para. 130].

Contention is indeed mentioned in Struhsaker's method, where it is applied in a very limited way: A subscriber access device uses contention only when submitting initial requests for service [para. 135-136]. The contention-based access method used by Struhsaker is *not asynchronous and does not allow the initiation of transmission in continuous time* by the access point when a station is not transmitting and by a station when the access point is not transmitting. Service

requests must be transmitted by the subscriber access devices in specific "contention slots," designated by the base station (Fig. 3), in which subscriber access devices send fixed format length transmissions for initial requests for service [para. 135-136]. Since the AP specifies these time slots, there is no contention between the AP and the stations for these time slots. Contention is not used for the transmission of data traffic in Struhsaker's method. In contrast, the invention employs a distributed contention-based access method for all transmissions, the initiation of which occurs in continuous time, as long as no one is transmitting, and can vary in length. Distributed contention-based access does not require special service request channels/time slots.

Claims 22, 32, and 37 are not anticipated by Struhsaker's method. Struhsaker's method does not cause stations, which would be otherwise free to transmit when the channel is idle, to refrain from transmitting at certain times. In Struhsaker's access method, the AP instructs each station when to transmit and when to cease transmitting. Because station transmissions are segregated in one segment of the TDD frame, which follows the downlink segment, no station will be transmitting at the end of the TDD frame. Struhsaker's access method and the invention produce different behavior for both the stations and the AP. Since according to the invention, the stations are engaged in distributed asynchronous contention-based medium access, when the stations will transmit and for how long is not determined in advance. A station is not told by the access point when to transmit and for how long, as it would be in Struhsaker's method. The channel is not set aside for any transmission, and each transmission attempt risks collision. This is because stations contend for the channel independently of one another and of the AP, according to a distributed contention-based medium access protocol like CSMA/CA. Such a protocol allows a station to transmit if the channel is idle, thus opening the possibility for two or more stations to transmit at once. Claim 22, 32, or 37 causes the stations, which are engaged in channel access independently of one another and without direction from the access point, to refrain from transmitting at specified times, thus giving the access point a fair chance to seize the channel by contention and thus avoid uplink channel capture. Uplink channel capture does not arise in Struhsaker's method because the AP is in complete control of the schedule by which transmissions occur. Claim 22, 32, or 37, together with its respective supporting claim, does not produce the same behavior as Struhsaker's method. The access method in the invention remains distributed contention-based; collisions are still possible; and the AP may start transmitting prior to the 'uplink channel release time' if the stations cease transmitting sooner. Struhsaker 's method is centralized deterministic access; collisions are not possible according to his method; and the AP starts transmitting at the pre-specified start if the TDD frame regardless of the stations' traffic.

The action report cites the use of a Scanning Beam Map by the base station as anticipating claims 24, 28, 34, and 38. The action report correctly observes that, according to Struhsaker's method, times in a TDD frame are allocated to specific scanning beams for downlink and uplink transmissions. This is part of the centralized deterministic access method, according to which the access point tells each station precisely when to transmit. In the invention, the stations are engaged in *distributed asynchronous contention-based medium access*. A station is not told by the access point when to transmit and for how long, as they would be in Struhsaker's method. Stations contend for the channel according to a protocol like CSMA/CA, which allows a station to transmit if the channel is sensed idle – that is, when no one else is transmitting. Claims 24, 28, 34, and 38 provide a way for the access point to block uplink transmissions from starting on one beam while the AP is transmitting on another. The AP does so while preserving the character of the access mechanism, which remains contention-based and distributed, and does not require the access point to tell individual stations when to transmit and when to cease transmitting.

Struhsaker's method does not anticipate claims 25, 26, and 39 of the invention, either. Struhsaker's method does not describe the type of access networks disclosed by claims 25, 26, or 39 and their respective supportive claims. His access method is *TMDA*, which requires that all subscriber access devices be *synchronized*. [para. 234, 244] He further requires that all base stations be synchronized. He discloses elaborate schemes for clock synchronization. [para. 143-

163, Fig. 4] As the access networks to which the invention applies employ an asynchronous contention-based access protocol, they do not require synchronization. Claim 25 does not require clock synchronization. It discloses how the simultaneous release of the channel by all stations can be achieved simply by using the end of the downlink transmission as a reference time. Claims 26 and 39 disclose how the same can be achieved also when stations have their clocks synchronized.

Regarding claim 27, the action report cites Struhsaker [para. 191] as anticipating this claim. Struhsaker assigns bandwidth to individual subscribers, which must be based on information including minimum QoS requirements, service level agreements, past usage, and current physical layer parameters. [para. 191] The invention does not assign any bandwidth, as it employs *asynchronous contention-based medium access.* My method does not require or retain information on individual subscribers. Claim 27 adapts the schedule of uplink channel release to reflect the time of day, aggregate traffic intensity, or network conditions.

Item 4

Claims 23 and 33 are not anticipated by Struhsaker in view of Daane [U.S. Patent No. 6,754,196 B1] because neither Struhsaker's invention nor Daane's invention deals with distributed contention-based medium access, as does the invention. The dummy frames are not sent in order to prevent stations from sensing an idle channel and transmitting upstream in Daane's method. Whether dummy frames are transmitted on the downlink is irrelevant with regard to the upstream transmissions, as stations transmit on a different frequency than the network manager (which is equivalent to access point in the invention) [col. 3, lines 6-13]. Moreover, the stations in Daane's method do not rely on a carrier sensing protocol, like CSMA, to access the channel. Like Struhsaker, Daane also uses TDMA, which is centrally controlled by the access point. The network manager allocates time slots to the stations.

Item 5

Claims 29, 35, and 40 were rejected over Struhsaker in view of Admitted Prior Art. The Struhsaker method is different from the method in the invention and applies to a different system. The described prior art is different from the compound acknowledgement of the invention. The compound acknowledgment facilitates the prompt acknowledgement of a transmission when immediate contention-free access is not possible for returning an acknowledgement without causing interference, as for instance would occur if the AP acknowledged an uplink transmission while another station was still transmitting. The Block Ack policy disclosed in the IEEE 802.11e standard is not motivated by and does not address the same limitations. The Block Ack offers a means for saving bandwidth by enabling the source to temporarily postpone acknowledgements, which are received all together when the source is ready and sends a BockAck Request. A Block Ack thus requires prompting by the source. The compound acknowledgement policy of the invention does not permit the source to postpone acknowledgements at its discretion. Acknowledgment is *sent without prompting before the time when control of the channel is relinquished by the destination.*

Claims 30 and 35 were rejected over Struhsaker in view of Admitted Prior Art, and specifically over the 802.11e Block Ack policy. The 802.11e policy for transmitting a Block Ack is different from the acknowledgement policy in the invention. If one generalized the 802.11e Block Ack to enable an access point to transmit an acknowledgement for multiple frames from different stations, there would be a requirement for the access point to receive a BlockAck Request from each station and acknowledge each such request immediately (within SIFS time). This would cause interference, as explained above. The compound acknowledgement policy of the invention avoids this problem.